USER MANUAL

MK series spindle driver
2.2KW /3.7KW /5.5KW/7.5KW/15KW

WENLING YUHAI ELECTROMECHANICAL CO.,LTD.
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Precautions

Please comply with the following safe rule when Installation、wiring、operating our product,or may cause the damage to the device or person.

◆ Installation

Note

★ Please do not installation when the controller damaged or component lacked,or may cause the Device damaged or personal injury.

★ Please install on the metal plate,keep away from fire goods,or may cause fire disaster.

★ Please screw up the screw which use to fix the controller,or will cause the controller drop down.

★ When Installation,must avoid the drill residue drop in to the controller,or will damage the controller.

◆ Wiring

Risk

★ Before wiring,please confirm the power supply cut down,or will cause the device damaged and personal injury.

★ Ask professional electric engineer to do the wiring work,or,will cause the device damaged and personal injury.

★ The controller input output cable should use the appropriate section cable according to the controller power.

★ Please confirm the input power supply accord with the product nameplate,or will cause the device damaged and personal injury.

★ Grounding terminal E must ground reliably,or will have the risk of electric shock.

★ Prohibit to set the scram、locking circuit out of the controller,or it will cause controller

★ Please do not do the high-voltage insulation test and insulation test to the controller,or it will damage the controller.

★ Please connect the brake resistor properly according to the wiring diagram,or it will cause fire disaster.

★ Major circuit wiring should separate with control circuit,or it will disturb the control signal.

★ Prohibit connect the input AC power supply to the controller output terminal U、V、W ,or it will cause controller damaged.

◆ Running

Risk ⚠
★ After connecting the power supply,prohibit to touch the controller terminal,or it will cause the device damaged and personal injury ★ Heat dissipation and brake resistor has high temperature,please do not touch,or it will cause the device damaged and personal injury ★ Before running,please confirm the load is in range of motor and machine application,or it will cause the device damaged and personal injury ★ Please do not modify the controller controller parameter at random,or it will cause the device

◆ **Maintain and Checking**

Risk ⚠
★ Ask professional electric engineer to do the checking and maintain. ★ Prohibit retrofit controller privately,or it will cause device damaged and personal injury. ★ Please cut down the power when dismantle the out cover.Before Power on,please must install the cover,or it will cause the device damaged and personal injury. ★ After power off,please wait until the charging indicator light off,then do the maintain,to avoid capacity residue cause the personal injury. ★ When charging,prohibit wiring and touching the controller terminal,or it will cause the device damaged and personal injury. ★ CMOS integrated circuit exsit in the circuit board ,please do not touch by hand,to avoid the static damage the circuit board.

Contents

Product Feature

High Performance

Control function comprehensive precise:Stable speed control、Precise position control、Excellent torque control.

Safety&Reliable

Product according to the international standard,pass CE certificate.Have multi protect circuit,to protect the device safe.

Telecommunication Function(Option)

Product have telecommunication function,only need to connect with a SIM card module,available to operate the controller by handphone internet.

Strong extensional capability（Option）

Different various extensional module can be deployed in the controller,Like digital terminal extensional module、simulate terminal extensional module、encoder feedback fractional frequency output、485 bus（ModBus RTU）、CANopen、GSM/GPRS module、nixie tube display module、two position loop module connector,available to customer function module according the different application,easy to connect with various control device like PLC、Touch screen、Text Display.

Performance Parameter

Input Power	Input voltage	Three Phase AC：380/400V
	Input frequency	50Hz/60Hz
	Allow voltage wave	+10%，-15%
	Allow frequency wave	±5%
Controller Characteristic	Control mode	Vector control
	Control speed range	0.01～500Hz,the max speed of 4 poles motor can be 15000rpm
	Speed control accuracy	±0.1%
	Accelerate and decelerate Speed timing	0.05～3000Hz/s
	Toque control characteristic	200% rated torque output under basic frequency:Accuracy ±5%
	Position control Accuracy	±1Pulse
	Braking mode	Energy braking,brake unit built-in
	Over-load	Two times overload
I/O Connector	Digital value input	10 Point,NPN Type、PNP type for selection
	Digital value output	4 Point,NPN type、PNP type
	Relay output	2 pcs,DC30V/1A or AC250V/1A
	Analog quantity input	Two ways,A0:±10V;A1 ; 0～+10V or 4～20mA for selection
	Out pulse input	One piece,High speed optocoupler,ABZ phase pulse、direction+Pulse、CW pulse for selection
	Motor encoder input	One piece,RS422 electrical level standard、resolver connector for selection
	Motor encoder output	One piece,RS422 electrical level standard,output frequency range 0~1MHz
	Extensional Connector	Available to built-in or external multi function module,like RS485(Modbus RTU)
Protection Function	Over-voltage protect、Low-voltage protect、Over-current protect、Motor over-heat protect and Power module over-heat protect、Over-load protect、Output short circuit protect、encoder abnormal protect	
Working Environment	Installation occasion request	Avoid direct sunlight,No dust,No corrosive,flammable gas
	Working occasion temperature	-10℃～+45℃
	Working occasion humidity	5～90%，Without frost
	Working altitude height	0～3000 meter,must derating use above 1000 meter
	Allow vibration range	Under 20Hz：1G；20～50Hz：0.2G

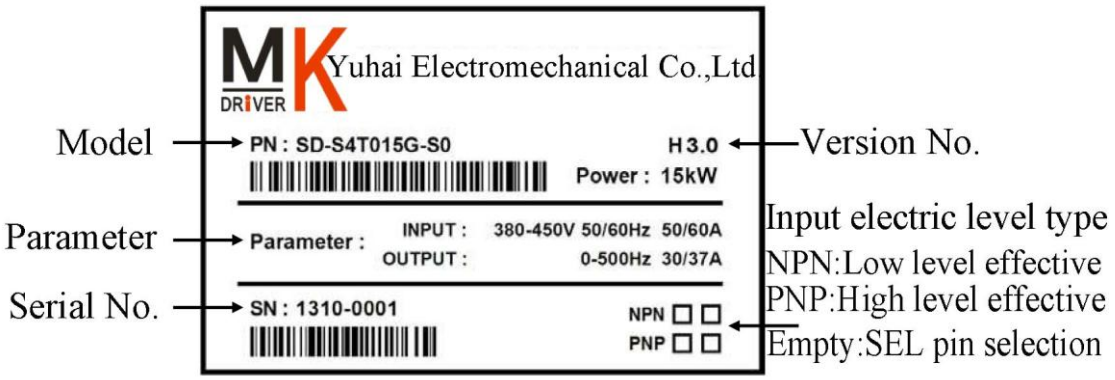
Product system

- **Product model**

SD - S 4T 015 G - S 0

Product Type	Product Series	Voltage Level	Power	Out Shape	Control type	Configuration Type
Servo Driver	S: Spindle	4T: 400V 2T: 200V	15kW	L : Small G : Big Empity: Standard	S: Standard E: With extensional card	0: Default Configuration X: Other Configuration

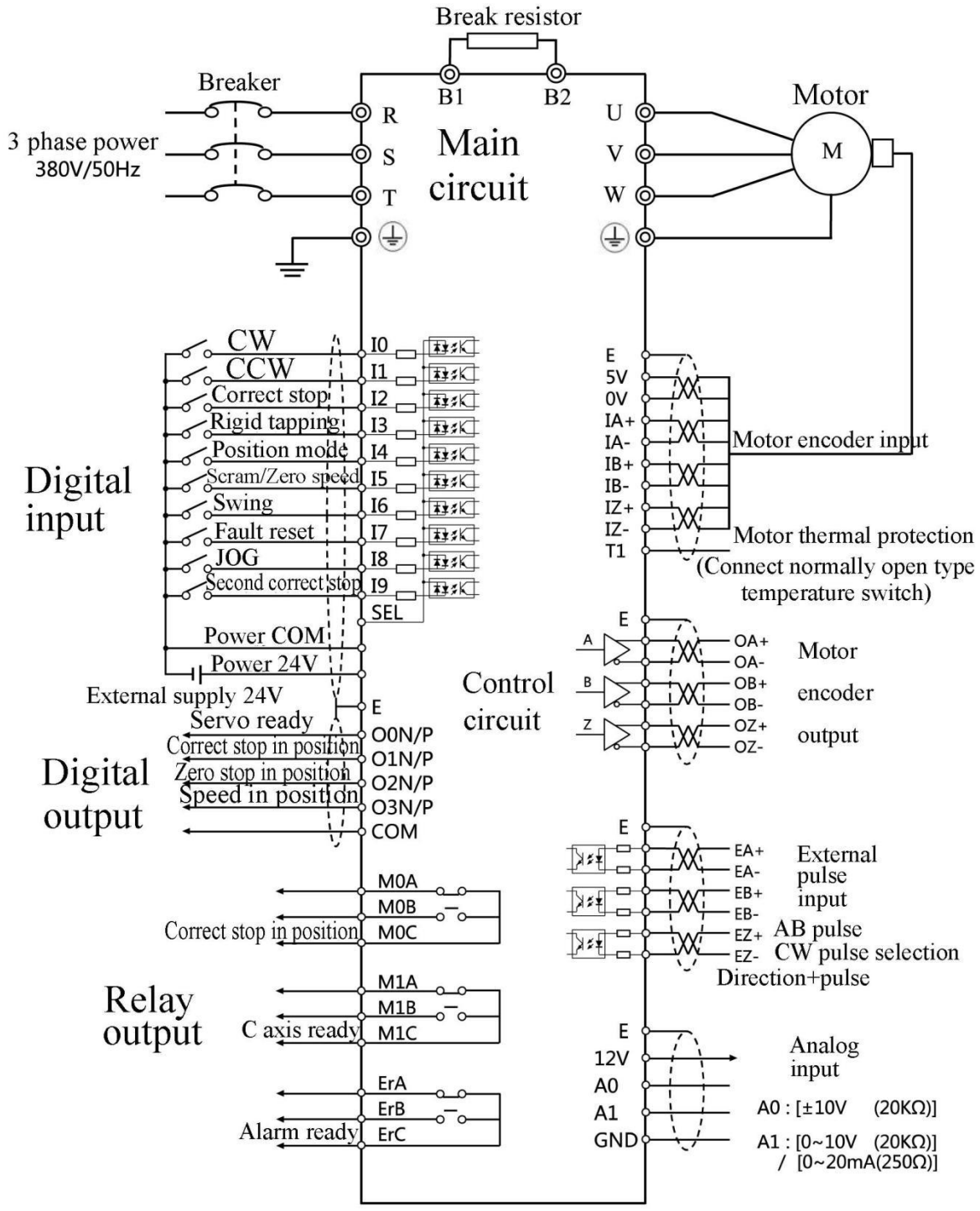
- **Product Nameplate**



◆ Product Specification

Controller Model	Out type	Matching Motor Power(kW)	Rated Output Current(A)	Rated Output Capacity(KVA)	Minimum Brake Resistor	Cable Diameter (mm^2)	Weight (Kg)
SD-S4T1P5	A Type	1.5	3.5	2.5	0.5kw / 75Ω	2.5	6
SD-S4T2P2		2.2	5	3.8	0.5kw / 75Ω	2.5	6
SD-S4T3P7		3.7	8	5.6	1kw / 40Ω	4	6
SD-S4T5P5L		5.5	13	8.6	1kw / 40Ω	4	6
SD-S4T5P5G	B Type	5.5	13	8.6	1.5kw / 32Ω	6	8
SD-S4T7P5		7.5	17	11	1.5kw / 32Ω	6	8
SD-S4T7P5G		7.5	17	11	1.5kw / 26Ω	6	8
SD-S4T011		11	25	17	1.5kw / 26Ω	6	8
SD-S4T011G		11	25	17	1.5kw / 26Ω	6	8
SD-S4T015L		15	32	20	1.5kw / 26Ω	6	8
SD-S4T015G	C Type	15	38	25	2kw / 40Ω * 2	10	16
SD-S4T018		18	39	26	2kw / 40Ω * 2	10	16
SD-S4T022		22	45	30	2kw / 40Ω * 2	16	16
SD-S4T030	D Type	30	60	40	2.5kw / 40Ω * 3	25	25
SD-S4T037		37	75	50	2.5kw / 40Ω * 3	25	25
SD-S4T045	E Type	45	90	60	2.5kw / 40Ω * 4	35	38
SD-S4T055		55	110	72	2.5kw / 40Ω * 4	50	38
SD-S4T075	F Type	75	150	99	2.5kw / 40Ω * 6	70	55
SD-S4T090		90	178	99	2.5kw / 40Ω * 8	70	55
SD-S4T110	G Type	110	210	145	2.5kw / 40Ω * 9	90	95
SD-S4T132		132	255	145	2.5kw / 40Ω * 10	90	95

Wiring Statement



Note：

1. 24V-COM need external supply 24V，IO can work，if need inner supply power,pls. Tell us when order；

2.Digital value input NPN、PNP type can be set by SEL pin,set mode check “Digit value input type statement”;

3.Digital value output has open collector output（output 0V when valid），open emitter output（output 24V when valid）；

4. Motor encoder connector default receive optical-electricity encoder 422differential signal,if need connect transformer,please Tell us when order.

Main Loop Terminal Statement

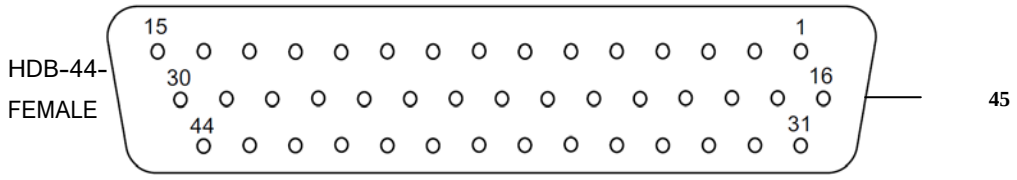
Terminal	R，S，T	B1，B2	B1/P , N	U，V，W	⏚
Application	Three phase AC power input	Connect brake resistor	DC generatrix positive/negative electrode	Connect motor	Grounding

Note：

1. Main loop wiring cable,should choose suitable section cable according to the controller power；
2. Grounding terminal E must connect ground reliably,or it will cause electric shock；
3. Main loop wiring should separate with control loop wiring,or it will disturb the control signal；
4. Prohibit connect the AC power to the output terminal U、V、W 上,or it will damage the controller；
5. B1/P and N terminal only lead to controller above 15GKw（within 15GKw）.

Control Loop Terminal Statement

I/O connector pin definition diagram



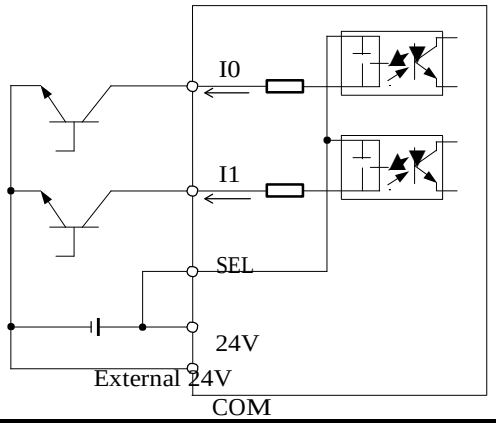
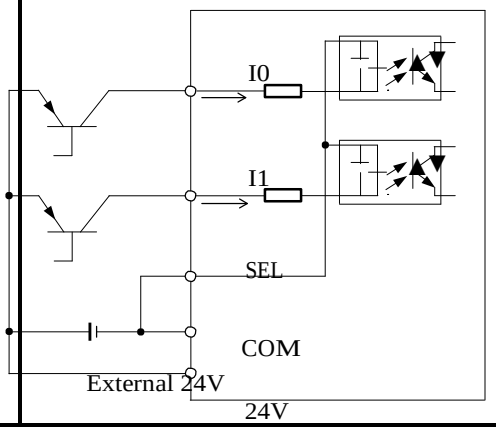
◆ **I/O connector statement(CN1)**

	Digital value input		Digital value output		Analog quantity input		Programmable relay output		Alarm relay output	
	Terminal	Corresponding Pin	Terminal	Corresponding Pin	Terminal	Corresponding Pin	Terminal	Corresponding Pin	Terminal	Corresponding Pin
I/O Input/ Output	I0	22	O0N	6	A	14	M0A	32	E	1
	I1	23	O0P	36	A	15	M0B	33	E	17
	I2	7	O1N	21	12V Power	30	M0C	31	E r	16
	I3	8	O1P	35	GND	29	M1A	18	E	45
	I4	9	O2N	5	E	45	M1B	3		
	I5	10	O2P	34			M1C	2		
	I6	11	O3N	20			E	45		
	I7	26	O3P	4						
	I8	24	2	39						
	I9	25	COM	40						
	SEL	12	E	45						
	E	45								
Statement	10Point NPN、PNP type can be selected by SEL PIN		4Group 4 Point NPN Output 4 Point PNP Output		A0： ±10V A1：0～+10V or 0～20mA		Programmable relay output A-C normal close B-C normal open		Alarm relay output ErA-ErC normal close ErB-ErC normal open	

Note：

1. COM is digit input&output common port, GND is analog quantity input ground,GND separate with COM；
2. 24V-COM need external 24V power supply,if need inner power supply please tell us when order；
3. Digit value input type has NPN（valid when low electric level），PNP（valid when high electric level）,Setting mode please check”Digit value input type statement”；
4. Control loop cable separate with main loop cable and other motor cable,or it will disturb the control signal；
5. To improve the system anti-interference ability,control loop cable please use twisted shielded pair cable.

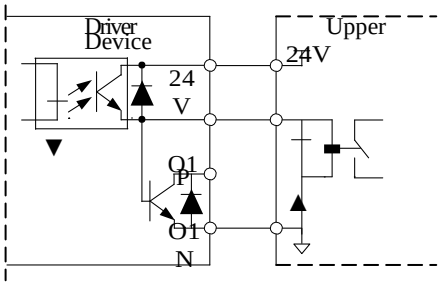
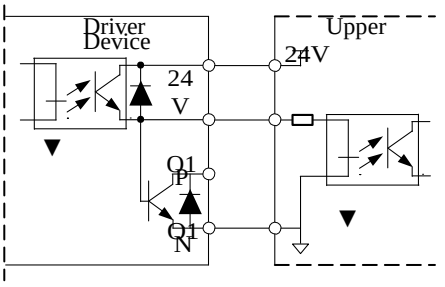
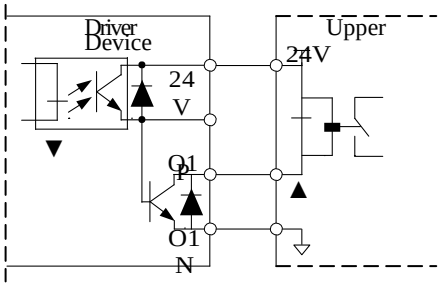
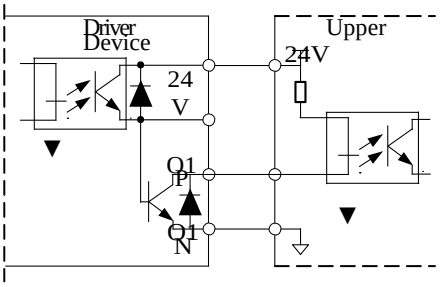
◆ Digit Value Input Type Statement

	NPN type(Valid when low electric level input)	PNP type(Valid when high electric level input)
Input circuit connector mode		

Note：

1. Digit value input type selected by SEL（12 pin）：
   a) SEL connect to 24V,input type is NPN,valid when input low electric level；
   b) SEL connect to COM,input type is PNP,valid when input high electric level；
2. If customer confirm the input electric level type,SEL can be connected in the inner driver；
3. Digit value input need external 24V power supply,if need controller inner 24V power supply,please tell us when order.

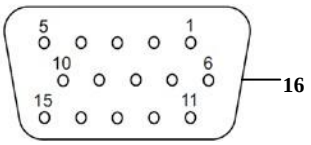
◆ Digit Value Output Type Statement

	Relay Circuit	Photocoupling Circuit
Open Emitter Output		
Open Collector Output		

Note：

1. Digit Value output need external 24V power supply,if need driver inner 24V power supply,please tell us when order；
2. When driver relay coil inductive load,please must connect to diode bypass,diode rated current should bigger than loop current,Diode reverse voltage resistance should bigger than three times of external power voltage.

HDB-15-FEMALE

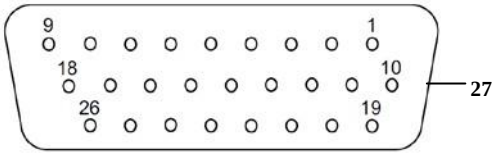


◆ **Motor Encoder Input Connector（CN2）**

	Photoelectricity Encoder			Rotate Transformer			Motor Heat Protection Connector	
	Terminal	Pin	Function	Terminal	Pin	Function	Terminal	Pin
Motor Encoder Input	IA+	6	A phase pulse input	EXC+	3	Rotate driver output	T1	9
	IA-	1		EXC-	8		0V	13
	IB+	7	B Phase pulse input	SIN+	2	SIN phase signal input		
	IB-	2		SIN-	7			
	IZ+	8	Z Phase pulse input	COS+	6	COS phase singal input		
	IZ-	3		COS-	1			
	+5V	11	Encoder 5V power	E	16	Shielding grounding		
	0V	12						
	E	16	Shielding grounding					
Statement	5V drive difference signal input,RS422 receive highest responding frequency 1MHz			Rotate transformer connector			Deploy normal open temperature switch	

Note： Motor encoder connector acquiescently receive photoelectricity encoder 422 difference signal,if need connect with rotate transformer,please tell us when order.

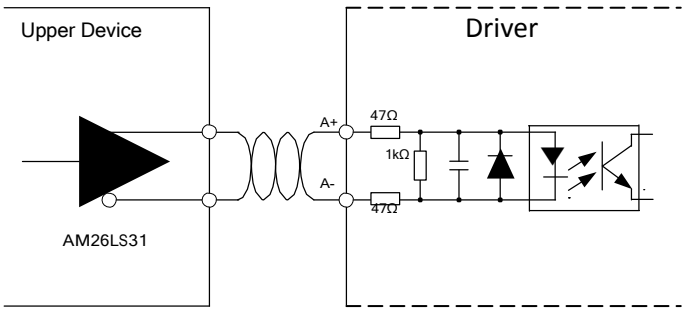
HDB-26-FEMALE



◆ **External Pulse Connector（CN3）**

	AB Phase Pulse/Direction+Pulse/CW Pulse			Encoder Feedback Output		
	Terminal	Pin	Function	Terminal	Pin	Function
External Pulse	EA+/ EP+/ CW+	2	A phase、Pulse、CW Pulse Input B phase、Direction、CCW Pulse input	OA+	9	A phase pulse output
	EA—/ EP—/ CW—	11		OA—	18	
	EB+/ ED+/ CCW+	4		OB+	17	B phase pulse output
	EB—/ ED—/ CCW—	13		OB—	8	
	EZ+	3	External Z phase input	OZ+	7	Z phase pulse output
	EZ—	12		OZ—	16	
	+5V	26	Manual pulse power			
	0V	25				
	E	27	Shielding grounding			
Statement	AB Pulse、Direction+Pulse、CW Pulse for selection High speed optocoupler input,the max responding frequency is 1MHz			RS422 output,5V driver difference signal output, The max responding frequency is 1MHz		

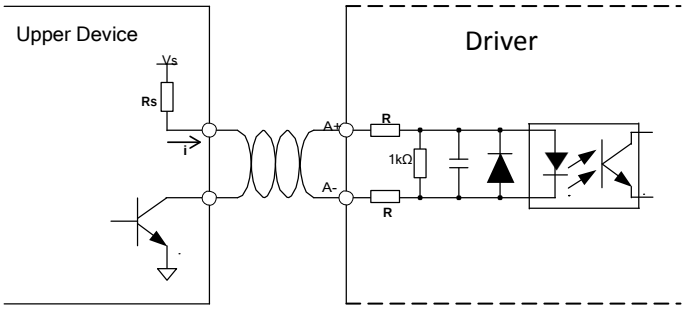
◆ External Input Pulse Type Statement



RS422 Difference Signal driver

Note：

1. Driver acquiescently set to receive RS422 difference signal driver；
2. This driver mode normally use to connect with CNC numerical system.



Open Collector Signal driver

Note：

1. It needs connect external current-limiting resistor Rs when adopt this connect mode,confirm driver current i around 10mA,driver inner current-limiting resistor R is 47Ω,Vs and Rs

   Set value as followings:（Must ensure the driver current do not exceed 18mA,or it will damage the inner circuit of controller）

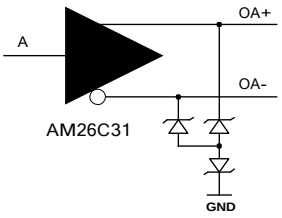
   a) Vs = 24V 时，Rs = 2kΩ； b)

   Vs = 12V 时，Rs = 1kΩ； c)

   Vs = 5V 时，Rs = 200Ω；

2. Customer can inform us which driver mode adopt when order,and tell external voltage Vs,factory will adjust the value of inner driver current-limiting resistor R,customer do not need to add current-limiting resistor Rs external.
3. This driver mode normally used to connect with PLC device etc.

◆ Motor Encoder Feedback Output Statement



1. Motor encoder feedback output is no frequency division RS 422 difference signal；
2. If need frequency division output,or other type output signal,please contact with factory.

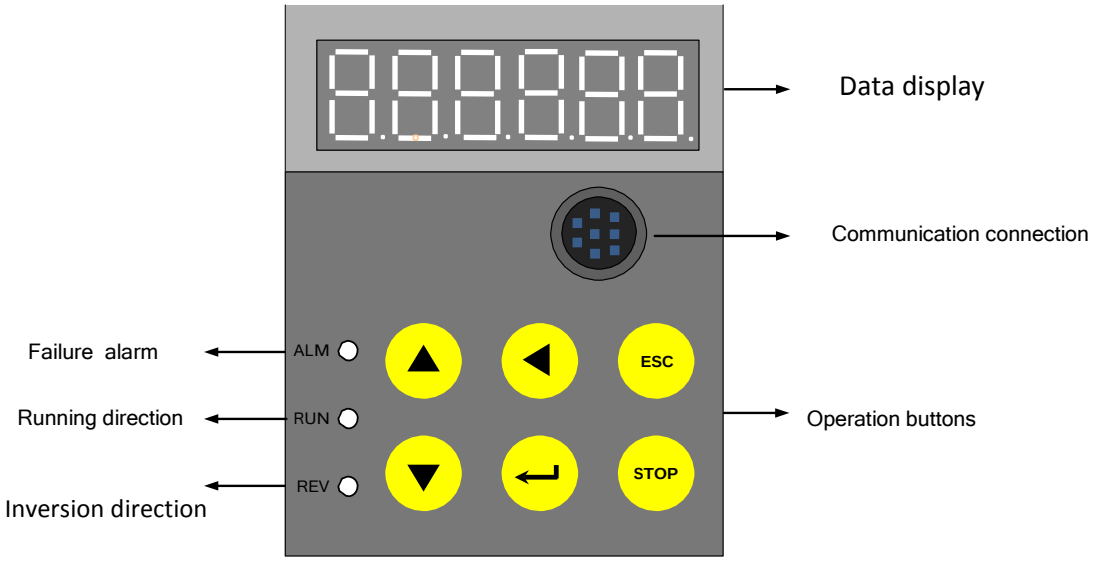
Parameter Statement

Application	Parameter No	Parameter Name	Setting Range		Unit
Motor parameter	E00	Motor fundamental frequency	0.00 ～500.00	*	Hz
	E01	Motor rated current	0.0～500.0	*	A
	E02	Motor poles number	2～12	4	-
	E03	Motor slip	1～900	*	r/min
	E04	Motor encoder line number	1～60000	1024	-
	E05	Motor field current	1～100	50	%
	E06	Motor encoder pulse filtering time	1～200	30	0.1ms
	E07	Motor zero speed slip compen	1～100	80	%
	E08	Slip compen over motor fundamental frequency	0～150	30	%
	E10	Motor slip benchmark when in speed control	1～900	*	r/min
	E11	Motor slip gain when in speed control	1～100	*	-
	E12	Motor slip benchmark when in position control	1～900	*	r/min
System parameter (Suggest to modify under the instruction of factory)	E20	Output torque amplitude limiting when accelerating	0～200	100	-
	E21	Output torque amplitude limiting when decelerating	0～200	100	-
	E22	Torque saturation gain	0～550	450	-
	E23	S curve setting value	1～20000	1000	-
	E24	Stable speed integral time constant change point	1～500.00	*	Hz
	E25	Acceleration and deceleration integral time constant change point	1～500.00	*	Hz
	E30	Proportional gain	0～100	80	%
	E31	Integral gain	0～150	100	%
	E32	Zero speed current gain	1～100	50	%
	E33	Current gain	1～150	60	1/10
	E34	Current gain change point	1～300.00	50.00	Hz
	E35	Speed loop integral time constant	1～1000	20	0.1ms
	E36	Integral time constant when stable speed	1～20000	200	0.1ms
	E37	Integral time constant when accelerating	1～20000	200	0.1ms
	E38	Integral time constant when decelerating	1～20000	1000	0.1ms
	E39	Position loop integral time constant	1～1000	20	0.1ms
Function selection	E40	Speed command input type selection	0:0 ～ 10V, 1: ±10V, 2:Outer pulse		
	E41	Speed control direction selection	0:Default direction, 1:Opposite to default direction		
	E42	Whether to ban reversal	0:No ban reversal, 1:Ban reversal		
	E43	Control mode selection	0:Normal mode, 1:High speed mode		
	E44	Position control mode selection	0:Synchronous mode, 1:Following mode,please re-up electricity after change		
	E45	JOG direction selection	0: JOG forward, 1:JOG reverse		
	E46	Low voltage protection selection	0:Protection, 1:No production		
	E60	Motor encoder selection	0:Photoelectric encoder, 1:Rotation transformer		
	E61	Outer input pulse selection	0: AB pulse, 1:Direction+pulse, 2:CW pulse, 3: AB(No frequency multiplication		
	E62	Motor encoder phase sequence selection	0: A phase look-ahead, 1: B phase exceed phase		
	E63	Motor overheat protection selection	0:No protection, 1: Normally open type protection switch, 2:Normally closed type protection switch		
	E64	Outer input pulse direction selection	0:Default direction, 1:Opposite to default direction		
	E65	Outer pulse Z phase input	0:No, 1:Yes		

Application	Parameter	Parameter Name	Setting Range	Default Set	Unit
Speed Control	F00	Max.Speed(Speed Control)	1～15000	6000	r/min
	F01	Min.Speed(Speed Control)	0～100	0	r/min
	F02	Low Speed Acceleration(Speed Control)	0～10000	1500	0.05Hz/s
	F03	Low Speed Deceleration(Speed Control)	0～10000	1500	0.05Hz/s
	F04	Speed Loop Acceleration And Deceleration Switching Point	0～15000	3000	r/min
	F05	High Speed Acceleration(Speed Control)	0～10000	1500	0.05Hz/s
	F06	High Speed Deceleration(Speed Control)	0～10000	1500	0.05Hz/s
	F07	Speed Reaching Area	0～300	45	r/min
	F08	Speed Command Gear Ratio Numerator	0～60000	1000	-
	F09	Speed Command Gear Ratio Denominator	0～60000	1000	-
Position Control	F10	Max.Speed(Position Control)	1～15000	300	r/min
	F11	Min.Speed(Position Control)	0～60	1	r/min
	F12	Acceleration Rigid(Position Control)	0～10000	200	0.05Hz/s
	F13	Deceleration Rigid(Position Control)	0～10000	100	0.1Hz/s
	F14	External Input Pulse Filtering Time	1～10000	20	0.1ms
	F15	Inertia Correction Point	0～60000	200	Pulse value
	F16	Crawling Pulse Before Positioning Finish	0～60000	20	Pulse value
	F17	Position Control Precision	1～250	2	Pulse value
	F18	Position Command Gear Ratio Numerator	0～60000	1000	-
	F19	Position Command Gear Ratio Denominator	0～60000	1000	-
Accurate Stop(Positioning)	F20	Deceleration When Accurate Stop	0～10000	1000	0.05Hz/s
	F21	Deceleration When Accurate Stop Positioning	0～10000	200	0.1Hz/s
	F22	Accurate Stop Position Adjustment	0～60000	0	Pulse value
	F23	Speed When Looking for Z Phase Pulse	0～1000	60	r/min
	F24	Delay After Accurate Stop In Place	0～10000	20	2.5ms
	F25	Accurate Stop Input Mode Selection	0：Active high，1:Effective pulse		
	F26	Accurate Stop Mode Selection	0：Forward accurate stop，1：Contrary accurate stop 2：Nearby accurate stop		
	F27	Second Accurate Stop Position Adjustment	0～60000	2000	Pulse value
Scram	F30	Emergency Stop Deceleration	0～10000	1500	0.05Hz/s
	F31	Motor Delay Power Cut After Emergency Stop	0～10000	0	2.5ms
Rigid Tapping	F32	Maximum Speed In Rigid Tapping	1～3000	1500	r/min
	F33	Acceleration In Rigid Tapping	0～10000	3000	0.05Hz/s
	F34	Rigid Tapping Analog Resolution	1～1000	1	-
Swing	F35	Pendulum Angle	0～3600°	180°	°
	F36	Pendulum Speed	1～300	60	r/min
	F37	Pendulum Torque	0～1000	500	%
Jog	F38	JOG Speed	1～1500	60	r/min
	F39	JOG Acceleration	0～10000	1500	0.05Hz/s
Analog Correction	F40	Speed Command Resolution	1～10000	10	r/min
	F41	Analog Filtering Resolution Time Constant	5～10000	200	0.1ms
	F42	Zero Offset	0～4000	2000	-
	F43	Analog Positive Piecewise Point	0～15000	3000	r/min
	F44	Positive First Piecewise Point Offset	0～4000	2000	-

	F45	Positive Second Piecewise Point Offset	0～4000	2000	-
	F46	±10V Negative Piecewise Point	0～	3000	r/min
	F47	±10V Negative First Piecewise Offset	0～	2000	-
	F48	±10V Negative Second Piecewise Offset	0～	2000	-

Operator panel description

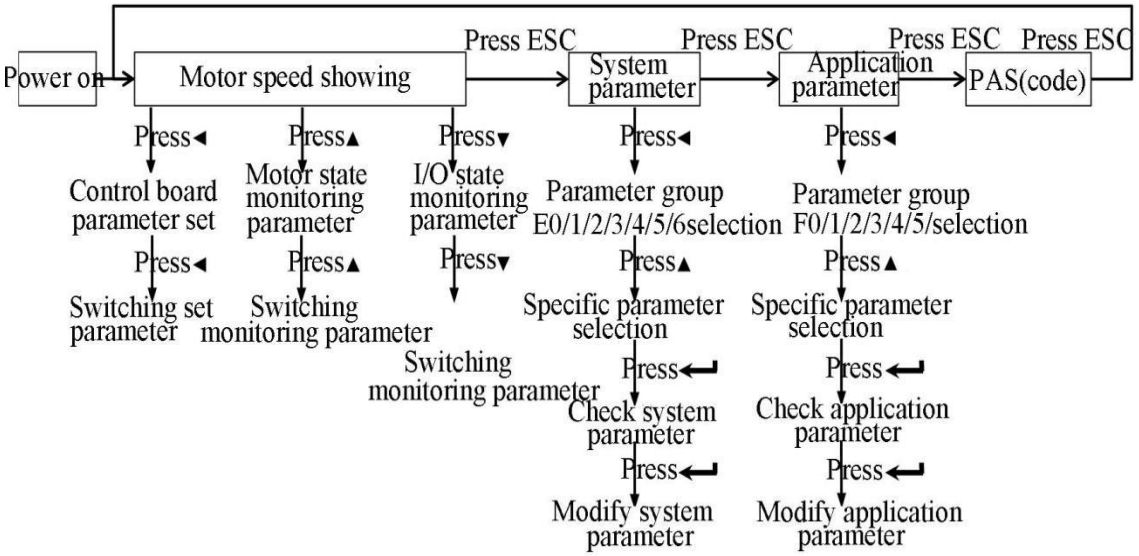


◆ **Operator name and function keys**

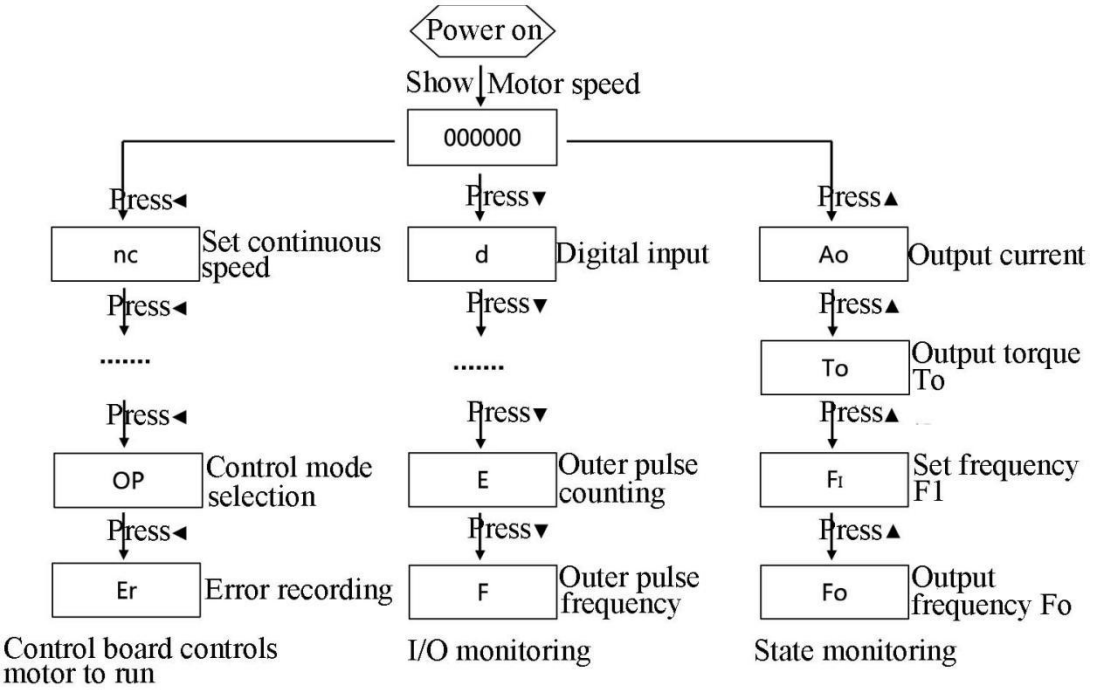
Button s mark	Buttons name	Buttons function
▲	up	When choose parameter ,choose the previous,when correction,add 1 to the parameter
▼	down	When choose parameter ,choose the previous,when correction,reduce 1 to the parameter
◄	left	When choose parameter ,choose the previous,when correction,left the parameter
	confirm	When choose parameter， confirm in, when correction, confirm then alarm reset
ES	cancel	Back to previous menu
STO	stop	When operator control, let motor stop。

↵

◆ **Parameter Display Statement**



Monitor Parameter Introduction



◆ Control Board Control And Monitoring Parameter Explanation

Parameter No.	Control Board Control Explanation	Parameter No.	I/O Monitoring Parameter Explanation	Parameter No.	Motor State Monitoring Parameter Explanation
nc	When board controls,setting speed of motor	d	Digital value input port From right I0 to I9	Ao	Output Current Show 2.0 means 2.0A
ro	0：Continuous rotation，1：JOG	o	Digital value output port From right O0 to M1	To	Output torque show 100 means output 100%rated torque
Ac	When board controls, motor acceleration	A0	±10V Analog input		
		A1	0~10V Analog input		
dc	When board controls, motor deceleration	P	Motor encoder accounting	FI	Set frequency Show 50.00 means 50Hz
F-E	Setting motor rotation direction 0：CW，1：CCW	H	Motor shaft absolute position		
OP	Control mode selection 0: External terminal， 1: Operation board, 2: Test running	E	Outer pulse accounting	Fo	Output frequency show 50.00 means 50Hz
Er	Last 10 faulty record Press ENTER to see	F	Outer pulse frequency		

Note： The controller set as testing running state when out the factory（OP set value is 2），please set OP to 0 after confirm motor running normally,more details please check"Test Running"Chapter

◆ Operating Panel Control Motor Running Statement

When display the motor speed,firstly press ◀ to set motor running speed nc,then press ◀ to set motrunning mode ro,then press ◀ to set motor running direction,then press ◀ to select OP as operation board control.

After set,press ↵ on the interface showing motor speed,motor is in zero speed power on state;After press ↵ in the any monitoring parameter,motor runs according to the set speed;In the motor running state,press STOP to brake to stop,motor will be in zero speed power on state,then press to be in cut off free state,long press STOP to stop running program(run The indicator light will be off).

Spindle Function Statement

◆ **Speed control mode：need connect I0 or I1 terminal！**

➢ **Speed Command**

Parameter	Definition	Statement
E40	Speed command input type selection	0：0～10V，1： ±10V，2：External Pulse
E43	Control mode selection	0：Normal mode，1：High speed mode
F00	Max Speed(speed control)	The max value of speed command
F08	Speed command gear ratio molecule	Real speed=speed command × F08/F09
F09	Speed command gear ratio denominator	
F40	Speed command resolution ratio	The minimum speed accord to increase or decrease the value of the resolution
	Analog quantity command	
F41	Analog quantity filter time constant	More value ,more effect to input analog quantity filter
F42-F48	Analog rectify parameter	Rectify analog quantity by set parameter 0～10V or ±10V 模拟
	Pulse command	
E61	External input pulse selection	0:AB pulse,1:Direction+Pulse,2:CW pulse
E64	External input pulse direction selection	0:default direction 1:Opposite to default direction

a) Control mode is modified by parameter E43,maximum speed in normal mode is 7500rpm,maximum speed in high speed mode is 15000rpm;

b) When speed control,speed command has 3 sources,selected by parameter E40;

c) When command type is 0~10V analog or ±10V analog，10V corresponding maximum speed is set by F00；

d) Analog can be revised by parameter F42-F48，can monitor by parameter A0、A1；

e) When analog type is pulse,there are 3 kinds of pulse types selected by E61,pulse direction can be modified by E64;

f) External sending pulse frequency f(Hz) corresponds motor running speed n(rpm) relation as following，parameter E04 is motor encoder lines.

$$n = \frac{f * 15}{E04}$$

g) Speed gear ratio acts on current actual speed,adjusted speed is not limited by maximum speed;

h) Sample：

1、 Use outer pulse mode:

A. Set E40 as 2；

B. Outer pulse is AB type（90°orthogonal pulse），need to set E61 as 0；

C. Motor encoder is 2500PPR,expect motor speed is 1500rpm，the outer pulse sending frequency needs 250KHz， if F00 set as 1000rpm，motor actual speed is only 1000rpm；

D. If gear ratio set as F08=2，F09=1，motor actual speed is 2000rpm（is not 3000rpm）。

2、 Use ±10V mode：

A. Set E40 as 1；

B. If set maximum speed F00 as 10000,set control model E43 as 1（high speed mode）；

C. Expect motor speed is 3020rpm，outer input analog voltage should be 3.02V；

D. If set speed command resolution ratio F40 as 50，actual motor speed is 3000rpm；

D. If set gear ratio F08=4，F09=1，motor actual speed should be 12080rpm，is not limited by F00；

F.Because now speed command resolution ratio F40 is 50，motor actual speed is 12050rpm。

➢ Motor rotate direction

parameter	Defi	Descriptio
E41	Speed control direction selection	0：Default direction，1：Opposite to default direction
E42	Weather to ban reversal	0：Not ban reversal，1:Ban to reversal
E64	Input pulse direction selection	0：Default direction，1：Opposite to default direction

a) 0-10V analog command，I0 behalf of forward，I1 behalf of the inversion

I0	I1	E42	E41	Rotate direction
cancel	cancel	X	X	Electric off
effective	cancel	0	0	positive
X	effective	0	0	reverse
effective	cancel	0	1	reverse
X	effective	0	1	positive
Any effective		1	0	positive
Any effective		1	1	reverse

b) ±10V analog and pulse command,there is direction information in command,only connect I0

command	I0	E42	E41	Rotate direction
X	cancel	X	X	Electric off
positive	effective	0	0	positive
negativ	effective	0	0	reverse
positive	effective	0	1	reverse
negativ	effective	0	1	positive
X	effective	1	0	positive
X	effective	1	1	reverse

X represent any state；

Using pulse mode,can modify E64 to change command direction signal ；

➢Acceleration and deceleration rule

Paramete	Defination	Description
F02	Low speed acceleration（speed control）	1、The acceleration and deceleration of motor can be separate in two steps to control when speed control； 2、 separate point set by F04； 3、The acceleration and deceleration of low speed step controlled by F02、F03，the bigger the faster； 4、The acceleration and deceleration of high speed step controlled by F05、F06，the bigger the faster；
F03	Low speed deceleration（speed control）	
F04	Speed ;oop transformation acceleration and deceleration	
F05	high speed acceleration（speed control）	
F06	high speed deceleration（speed control）	
E23	S curve setting	The bigger of value .the smaller of Deceleration speed of the target start speed . while this process will be longer
F30	Scram deceleration	**Signal scram I5 works or cancel I0/I1 signal，motor run in F30 speed and reduce to 0, at last for free**

◆ **Accurate stop（location）：need to connect I2/I9 terminal！**

➢ **Relate parameters of accurate stop**

Parameter	Define	Description
F20	deceleration in Accurate stop	Please check the accurate stop process curve
F21	Position speed reduction in accurate stop	
F22	Position adjustment in accurate stop	
F23	Find Z phase pulse speed	
F24	accurate stop Pulse in position then delay	In effectively pulse mode，the width of pulse setting value should bigger than I2 signals'
F25	accurate stop input model selection	0：high level active，1：pulse active
F26	accurate stop model selection	0：positive accurate stop，1：reverse accurate stop ，2：accurate stop nearby
F27	Second position accurate stop adjustment	The motion of signal connection of I9 and I2is same But when connect the I9 ,should follow its specify position for accurate stop
E65	External pulse Z phase input	0：non，1：exsit
F30	Scram deceleration	Signal scram I5 works or cancel I2/ I9 signal，motor run in F30 speed and reduce to 0, at last for free

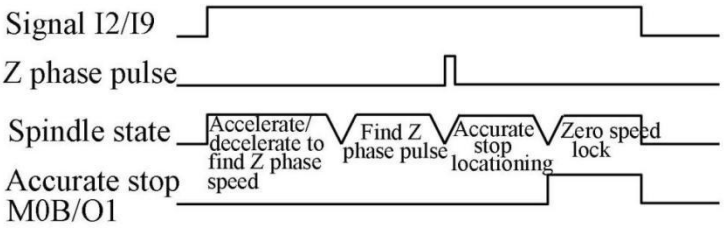
➢ **Accurate control time sequence**

✧ Z phase pulse（refer to origin point ）source has two kinds：

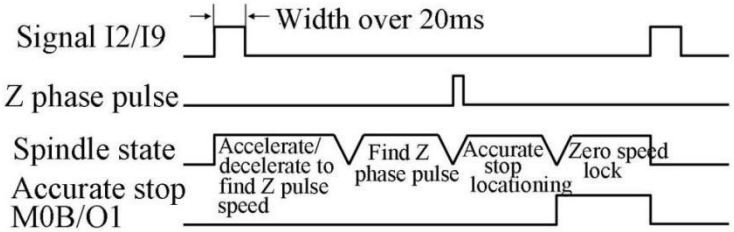
* Motor encoder Z phase：use for system of spindle transmission ratio 1：1 ，set parameter E65 as 0；

* Outer encoder Z phase：Use for system of spindle transmission ratio is not 1：1，spindle installs encoder or proximity switch,connect encoder Z phase signal or proximity switch signal to CN3 terminal EZ+(3Pin) and EZ-(12Pin) pin， and set parameter E65 as 1；

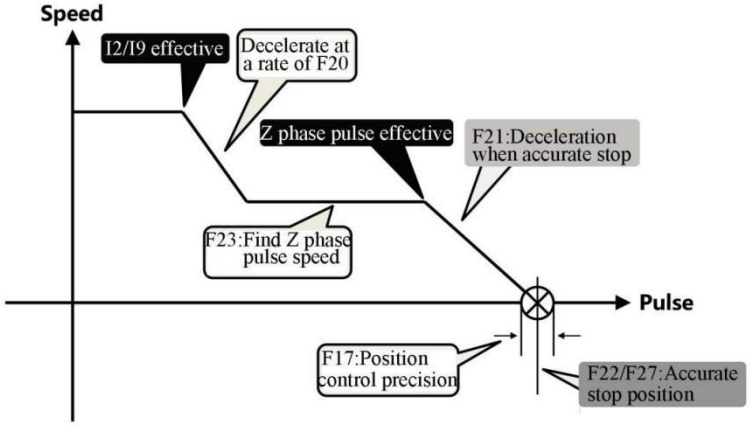
✧Active high(F25=0):



✧ Effective pulse(F25=1):



➢Accurate stop process curve



- **Spindle accurate stop position setting**

a) Firstly perform a spindle accurate stop,then cancel the accurate stop signal,make motor in free state and ;

b) By manual rotate motor or spindle reached needed accurate position;

c) Check monitor group parameter P，make P value write into accurate stop position parameter F22/F27;

d) Then do accurate stop,if there is small offset, remove by change F22/F27.

◆ **Analog rigid tapping：need to connect I3 terminal！**

Parameter	Define	Description
E40	Speed pulse input model selection	0：0～10V，1： ±10V，2：outpulse
F32	The max speed of rigid tapping	The speed of motor when input 10V analog
F33	The acceleration of rigid tapping	Motor acceleration and deceleration in rigid tapping
F34	rigid tapping analog resoltion	Normally for the small value setting， increase to read the accurate analog
F30	Scram deceleration	**Signal scram I5 works or cancel I3 signal，motor run in F30 speed and reduce to 0, at last for free**

a) select 0～10V analog command（E40=0），when tape back and motor reversing ,need to connect I1、I3 terminal at the same time；

b) select ±10V analog command（E40=1），only need to connect I3 terminal；

c) suggest to use pulse rigid tapping

◆ **Position control model（C shaft function, Indexing, Pulse rigid tapping）：need to connect I4 terminal！**

If in position control mode, the control instruction is only the external pulse

Parameter	Define	Description
E61	Input pulse selection	0：AB pulse，1：direction+pulse，2：reverse pulse
E64	Input pulse direction selection	0：default direction，1：reverse the default direction
E44	position control selection	0：synchronous mode，1：following mode
F10	Max speed（position control）	The limit of max motor shaft speed in position control（only in following mode）
F11	Mini speed（position control）	Mini motor speed in position control
F12	Rigid acceleration（position control）	Rigid acceleration in position control, the bigger the value,the greater the rigid
F13	Rigid deceleration（position control）	The faster of deceleration,but too much may cause the motor vibration and over shoot
F16	Crawl position before the end of the pulse	position control parameter，the bigger of the load inertia and friction ,should increase the value
F17	Position control accuracy	
F18	Position command gear radio numerator	Actually pulse= received pulse × F18/F19
F19	Position command gear radio denominator	
F30	Scram deceleration	**Signal scram I5 works or cancel I4 signal，motor run in F30 speed and reduce to 0, at last for free**

◆ **Swing：need to connect I6 terminal！！**

Parameter	Define	Description
F35	Swing angle	The sum of the bilateral swing
F36	Swing speed	The motor rotating speed in swing
F37	Swing torque	The peak torque of motor can output in swing
F30	Scram deceleration	**Signal scram I5 works or cancel I6 signal，motor run in F30 speed and reduce to 0, at last for free**

◆ **Jog direction：need to connect I8 terminal！**

Parameter	Define	Description
E45	Jog direction	0：Positive jog，1：reverse jog
F38	Jog speed	Motor rotating speed in Jog direction
F39	Jog accelerated speed	accelerated speed in Jog direction
F30	Scram deceleration	**Signal scram I5 works or cancel I8 signal，motor run in F30 speed and reduce to 0, at last for free**

I8	I0 or I1	E45	Roation direction
valid	cancel	0	positive
valid	valid	0	reverse
valid	cancel	1	reverse
valid	valid	1	positive

Test Running

Driver &Motor wiring and test running

Confirm wiring correct

a. driver power input R/S/T connect 3phase 380V /50HZ power
b. brake resistor connect B1.B2. do not connect on N terminal
c. driver output U/V/W must match the motor U/V/W connection
d. driver and motor should connect to PE;
e. motor encoder line connect to driver CN2 terminal (cable supplied by factory)
f. according to motor label .correct input E04 (encoder line) parameter, and standby parameter P to check weather right connection and actually encoder line or not
g. Pls temporarily pulled out the signal wire of CN1. CN3 terminal

Confirm motor phase sequence

h. set parameter OP to 2(phase study model) run the motor ,standby RPM and power
» in 10seconds appear Err-09 alarm, so will be the wrong phase sequence connection, please change driver the output U.V phase sequence 1
» if motor with steady 100rpm and current,so the phase sequence is right
***if reconnect to system,and do not sure the sequence, pls restudy of phase sequence study step**

Confirm normal running

i. set parameter OP to 1 (system control modul)
j. set motor rpm(nc) and run motor
k. standby RPM weather is wave（<±2rpm）, current weather is normal or not (no-load current is 0.1 times of rated current)
l. normal running , so the right connection of motor and driver;
~~set op to 0, into driver and test the running with up equipment~~

Driver &Upper device (CNC) wiring and test running

Confirm wiring correct

a. system signal I/O **connection**（CN1）
» need external supply 24 power to driver24V(39 Pin)，COM(40 Pin))；
» according the useful function connection to input signal (I0 ~ I9)，output (O0N ~ O3P)，transformer out put signal ,details please read IO parameter description
» standby parameter d and o to check weather the I/O terminal is normal or not

b. **analog control connection**（CN1）
» 0 ~ 10Vanalog connect to A1~GND：can standby parameter A1 and check the connection right or wrong;
» ±10V analog connect to A0~GND：can standby parameter A0 and check the connection right or wrong;

c. pulse control connection CN3）
»driver supply AB、direction+pulse、CW3 pulse input ways, through E61 to select parameter;
» details please read pulse connection description（Page 6、7);
» standby parameter E to check external pulse weather input normal or not ;

d. motor encoder feedback output（CN3）:
» driver supply the output of non frequency division encoder feedback, level is RS422D differential signal

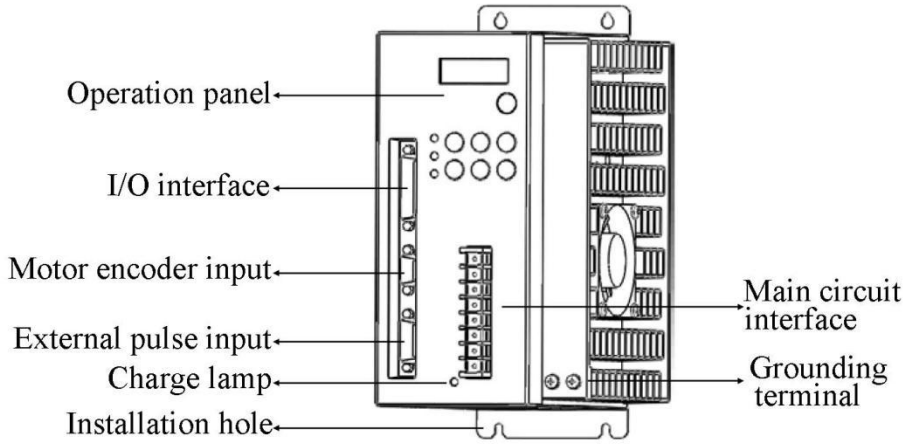
Confirm normal running

E. Analog control test running (Such as Siemens,Fanuc,KND,GSK system and so on)
»System input analog voltage signal and connect CW signal I0
»Monitoring controller speed,current parameter and so on,judge normal run or not.
»Motor actual speed has deviation with system set speed,can adjust analog deviation
»Giving some speed,repeat the above step debugging

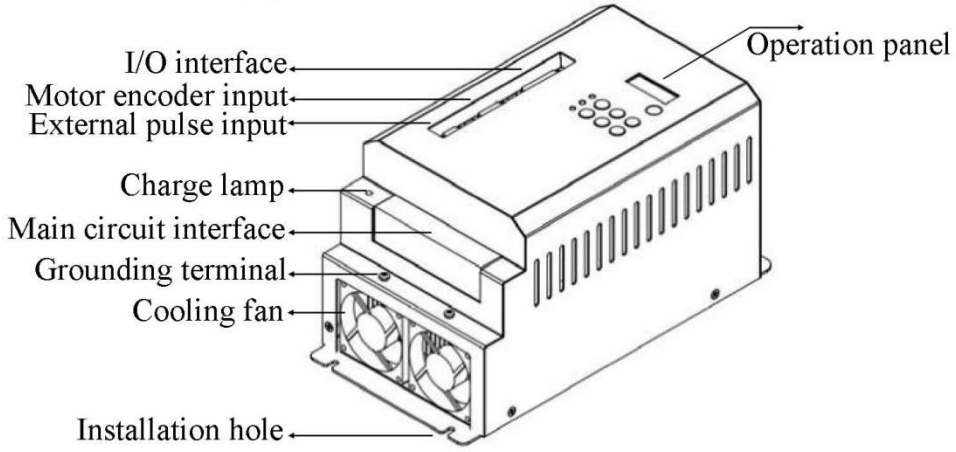
F. Pulse control test running (Such as Syntec, LNC system and so on)
»System output pulse signal(pulse speed connect I0,pulse position connect I4)
»Monitoring controller speed,current parameter and so on,judge normal run or not.

Dimension

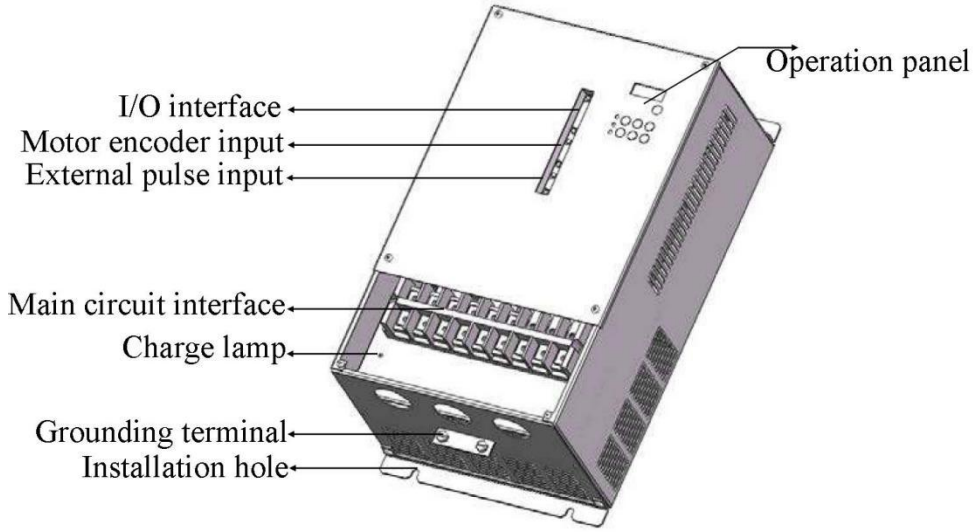
A type:1.5KW~5.5LKW dimensions



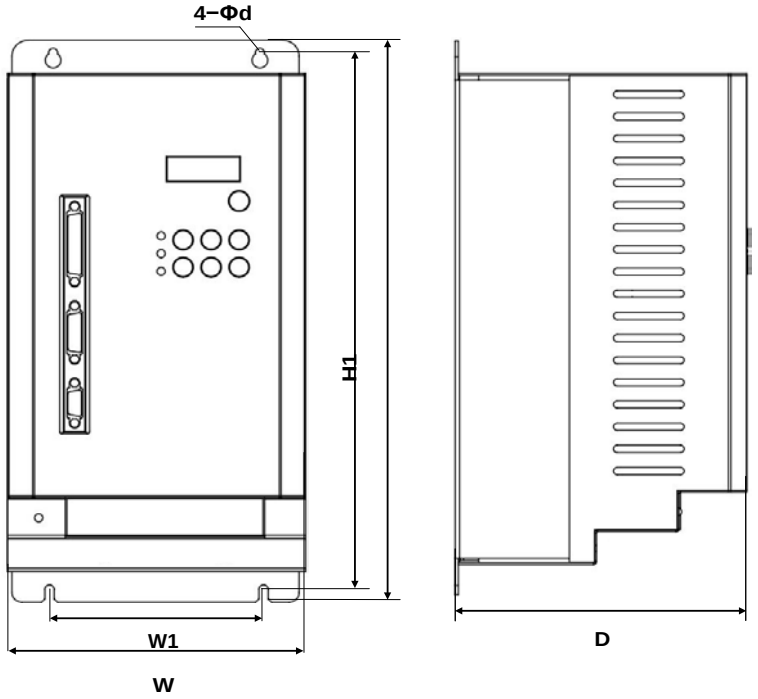
B type:5.5GKW~15LKW dimensions



C type~G type:15GKW~132KW dimensions



Installation Size



Controller size and weight

Controller item	Shape type	Size （mm）						weight （kg）
		H	H1	W	W1	D	d	
SD-S4T1P5	A type	268	255	130	70	212	5	6
SD-S4T2P2								
SD-S4T3P7								
SD-S4T5P5L								
SD-S4T5P5G	B type	350	334	181	130	184	5	8
SD-S4T7P5								
SD-S4T7P5G								
SD-S4T011								
SD-S4T011G								
SD-S4T015L								
SD-S4T015G	C type	450	430	280	180	225	7	16
SD-S4T018								
SD-S4T022								
SD-S4T030	D type	580	555	320	220	225	10	25
SD-S4T037								
SD-S4T045	E type	625	600	410	270	240	10	38
SD-S4T055								
SD-S4T075	F type	840	800	600	520	380	12	65
SD-S4T090								
SD-S4T110	G type	1100	1050	820	740	380	12	95
SD-S4T132								

Fault and Solve

◆ Fault alarm and solve

Fault coder	Fault Description	The reason may cause fault	Solve
Err-00	Over voltage protection	Too short of decelerate Braking resistor damage Braking resistor is	Extend decelerate time check braking resistor weather or not normal Check the size of braking
Err-01	Low voltage protection	input voltage is too low or too much change when sudden electrical	Check weather input current is normal
Err-02	Over voltage protection when acceleration process	Motor damage low power grid voltage wrong system setting too big overload ,too short of acceleration	Check weather motor is normal check weather input voltage is normal setting system parameters correctly extend acceleration time
Err-03	Over voltage protection when deceleration process	Braking resistor is not suitable wrong system parameter setting too big overload. Too short of deceleration time input of system is a short circuit.	Check weather the size of Braking resistor is suitable Correctly set the system parameter extend deceleration time check weather U、V、W is a short circuit the selection to match power
Err-04	Power module is overheat	Motor damaged too heat of the controller too big output current of the controller	Check weather motor is normal check weather cooling is normal check weather motor is in long time overload
Err-05	Fault of motor encoder	Wrong motor phase sequence wrong encoder parameter setting encoder	Check weather motor phase sequence is right check weather system parameter E04 is setting right

Err-06	Over heat protection	The motor temperature is over of setting	Check the motor weather or not damaged Checking weather the motor cooling is normal
Err-07	Current detect abnormal	The current detection circuit fault	Contact with technical support
Err-08	System fault	Controller was interfered,the program was lost	Restore factory setting
Err-09	Overload protection	Wrong motor phase sequence Fault of motor encoder motor stalling while overload	Confirm motor phase sequence , motor encoder is right and overload is suitable Correct system refer to parameterE20
Err-10	Motor phase sequence errors	Motor phase sequence errors	Change U、V、W any two phase of connections
Err-EP	EEPROM operation errors	Inner EEPROM fault	Restore factory setting or change the driver
Err-Co	Operation board signal failure	Correct system parameter is failure Operation board and main board communication error	Should not correct parameter when system running Operation board error ,please change driver
Err-LP	Inner signal failure	Correct system parameter is failure Operation board and main board communication error	Change driver

◆ Common fault analysis

➢ No display after driver on electricity

condition： operation board no display after driver on electricity。Tear down all the connection ,only keep the R/S/T 3 phase into line.

Reason and Solution：

charge lamp is not bright： Measured with a multimeter R/S/T into the line voltage， normal power supply： 300V<Voltage<440V；

if power supply is right， the rectifier bridge or charging resistance damage，so returned to our factory for the maintenance

charge lamp is bright： the rectifier bridge or charging resistance are normal， Switch power supply damage or fuse burned down, return to our factory maintenance.

- **The leakage switch protection**

  ✧ Condition：Leakage protector trip when servo spindle starts。

  Reason and Solution：

  * IF use the ordinary leakage protector, he electric leakage protection value should be big than 200mA, or cancel the leakage protector；

  * Suggest to use servo (frequency) delicated leakage protector, the electric leakage protection value should be big than 30mA；

  * Add the isolation transformer between the servo controller and ordinary leakage protector

- **The condition caused by encoder failure**

  ✧ **Condition：**

  * Appear Err-05 encoder error alarm

  * Appear spindle rotation at low speed and do not accept the control of speed commend

  * Appear coasters phenomenon

  * Speed is not balance when running and have significant impact type mechanical vibration

  * Found the current is significantly larger when Standby current Ao when non-load， and the current should be around rated value 15%

  * Standby torque To when non-load, showing big torque or approach the full torque

  * Appear Err-02，Err-03，Err-09 alarm commonly

  ✧ **Solution：**

  * Check weather CN2 terminal and encoder socket is connected encoder line or not；

  * If in right connection，rotating motor by hand and standby parameter P，IF the install motor encoder is 1024 line，the motor shaft run a circle and the parameter P should changed for 4096 pulse；

  * If no change of parameter P，please check or change the encoder line or change. Use the multimeter to measure the power supply of encoder on CN2 . If there is no voltage,the inner power supply of driver should be damaged .so pls change the driver

  * If right connected and power supply is normal ， so the encoder is possibly damaged ,please change the motor encoder；

  * If no change of parameter P，but the changing pulse is 10000 per circle, and the exactly encoder line is 2500PPR. Please compare with the encoder value of the motor label and correct the parameter E04.

- **Appear Err-01 under voltage failure**

  - **Reason：**

    * Instability of power supply voltage，please use the multimeter to measure the R/S/T port of controller，check weather the power fiuctuation is bigger；

    * IF large equipment stat nearby possibly cause the sudden under voltage, in this case we can't use the multimeter to measure that；

    Solution：

    * Add the pressure equipment；correct the parameter E46，shielding under voltage protection。

- **After sending the instruction system , the spindle is not running or not controlled in low speed**

  - Reason and Solution：

    ■ the main shaft is not controlled in low speed running，the possible reason is wrong phase sequence。

    ■ Perform OP=2（self study）operation，after success of the self learning ， then correct OP to 0（controlled by outside terminal ）；

    ■ Main spindle is not run，should check weather the controller received the right command pulse：

    For example：CNC perform command M03 S500，require the motor is CW in 500rpm 。

    Perform this command，system should connect controller I0 to input terminal ， by standby weather the most right side of the vertical bar for parameter d is bounce , confirm the IO is in correct access.

    - If no bounce ,so the signal is not in correct connection. So please check weather the IO terminal of CN1 is in right connection. Or weather 24V power supply and SEL terminal is in right connection.
    - If other vertical is bounce,so the 24V power supply and SEL terminal is in right connection.and IO line connected to other terminal.

    when confirm this command, the system may through by pulse ,0~10V analog or ±10V analog to show the speed command . following is the instruction：

    - If use the speed pulse ,setting E40=2,according the type of pulse set E61 .then according the standby parameter F (out pulse frequency) to check weather pulse is correct input；
    - If use 0~10 analog,set E40=0, according standby parameter A1 to check weather is input correctly；

- If use 0~10 analog,set E40=1, according standby parameter A0 to check weather is input correctly.

■ If all the above solutions not works ,please contact the factory for technical support。

➢ **Inaccuracy speed of the spindle**

Reason and Solution：

■ Pulse speed control：

Confirm weather the encoder parameter in CNC system is match for F04 parameter；

Weather the main shaft has transmission ratio；

■ Analog speed control：

Confirm weather the Max speed of main shaft in CNC system is match for F00 parameter；

Weather the analog voltage receiving is accurate , can standby parameter A0. A1；

If the analog is proportional to the deviation , for example , when set 1000rpm with actual motor speed 980rpm. If set for 2000rpm with actual motor speed 1960rpm, so can increase the speed for F00；

■ If the analog deviation as a fixed value, for example , please , when set 1000rpm with actual motor speed 980rpm. If set for 2000rpm with actual motor speed 1980rpm, so can adjust the parameter F4X

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If all the above solutions not works ,please contact the factory for technical support。

➢ **The position of main shaft is inaccuracy when accurate stopping**

Reason and Solution：

■ Fist time using or using changed main shaft parts, should adjust parameter F22/F27 to correct position；

■ Appear a stability of the deviation while using a litter while. Possible for the synchronous belt or synchronous belt wheel is loose

■ Appear continuously increasing of deviation while accurate stopping, please check the weather the encoder is loose；

■ Appear random deviation while accurate stopping, ; so please check weather the encoder line is disturbance and synchronous belt is loose；

■ If all the above solutions not works ,please contact the factory for technical support.